

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
7 February 2002 (07.02.2002)

(10) International Publication Number  
**WO 02/10415 A3**

(51) International Patent Classification<sup>7</sup>:

**C12N 15/82**

(81)

Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.

(21) International Application Number:

PCT/US01/23794

(22) International Filing Date:

27 July 2001 (27.07.2001)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

60/221,318 28 July 2000 (28.07.2000) US

(71) Applicant: **UNIVERSITY OF CONNECTICUT**  
[US/US]; 263 Farmington Avenue, Farmington, CT  
06030-6207 (US).

(72) Inventors: **LI, Yi**; 15 Sawmill Brook Lane, Mansfield Center, CT 06250 (US). **O'DONNELL, Colum, P.**; P.O. Box 2000, Carlisle, MA 01741 (US). **DUAN, Hui**; 1 Northwood Road-Apt. 15, Storrs, CT 06268 (US). **WU, Yan, Hong**; 15 Sawmill Brook Lane, Mansfield Center, CT 06250 (US). **MCAVOY, Richard**; 68 Brookside Lane, Mansfield Center, CT 06250 (US).

(74) Agent: **COUGHLIN, Daniel, F.**; Cummings & Lockwood, 700 State Street, P.O. Box 1960, New Haven, CT 06509-1960 (US).

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

(88) Date of publication of the international search report:  
20 June 2002

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: METHODS FOR THE CONTROLLED, AUTOMATIC EXCISION OF HETEROLOGOUS DNA FROM TRANSGENIC PLANTS AND DNA-EXCISING GENE CASSETTES FOR USE THEREIN

<b>XS<sub>1</sub></b>	<b>XS<sub>2</sub></b>	<b>Pro-1/R<sub>1</sub></b>	<b>Pro-2/R<sub>2</sub></b>	<b>TG</b>	<b>MG</b>	<b>XS<sub>2</sub></b>	<b>XS<sub>1</sub></b>
-----------------------	-----------------------	----------------------------	----------------------------	-----------	-----------	-----------------------	-----------------------

(57) Abstract: As disclosed herein, the present invention is directed to unique gene cassettes, and methods for their use, wherein the gene cassettes comprise multifunctional transgenic DNA sequences that completely, or nearly completely, excise themselves from the genome of plants into which they are introduced. The excision process is triggered in response to specific internal or external stimuli by means of excision/recombinase systems in unique combinations and orientations within the multifunctional transgenic sequences. Complete, or nearly complete, removal of the heterologous DNA significantly reduces the possibility of uncontrolled propagation of the transgenic species and may, more importantly, permit crops produced from transgenic plants to be co-mingled with non-transgenic crops for marketing purposes.

**WO 02/10415 A3**

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 01/23794

A. CLASSIFICATION OF SUBJECT MATTER  
 IPC 7 C12N15/82

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
 IPC 7 C12N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, BIOSIS, CHEM ABS Data, EMBASE, LIFESCIENCES, MEDLINE, PAJ, SCISEARCH, WPI Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 977 441 A (QUISENBERRY JERRY EDWIN ET AL) 2 November 1999 (1999-11-02) the whole document	1-13
X	WO 98 28431 A (DIRKS ROBERT ;INNES JOHN CENTRE INNOV LTD (GB); JONES JONATHAN DAL) 2 July 1998 (1998-07-02) page 14 -page 15; claims	1-13
Y	page 15, paragraph 2	14, 16
Y	EP 1 018 560 A (DNAVEC RESEARCH INC) 12 July 2000 (2000-07-12) claims	14
Y	WO 99 25840 A (BASZCZYNSKI CHRISTOPHER L ;GORDON KAMM WILLIAM J (US); LYZNIK LESZ) 27 May 1999 (1999-05-27) claims	16
	-----	
	-/-	

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

## \* Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority, claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

\*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

\*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

\*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

\*&\* document member of the same patent family

Date of the actual completion of the international search

Date of mailing of the international search report

16 April 2002

24/04/2002

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
 NL - 2280 HV Rijswijk  
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
 Fax: (+31-70) 340-3016

Authorized officer

Pilat, D

## INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US 01/23794

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 97 13401 A (LEE JANG YONG ;HODGES THOMAS K (US); HUQ ENAMUL (US); LYZNIK LESZE) 17 April 1997 (1997-04-17) page 16; claim 13; figure 1 ---	1-13
X	WO 96 04393 A (US AGRICULTURE ;DELTA & PINE LAND CO (US)) 15 February 1996 (1996-02-15) cited in the application claims ---	1-13
X	SUGITA KOICHI ET AL: "A transformation vector for the production of marker-free transgenic plants containing a single copy transgene at high frequency" PLANT JOURNAL, BLACKWELL SCIENTIFIC PUBLICATIONS, OXFORD, GB, vol. 22, no. 5, June 2000 (2000-06), pages 461-469, XP002173578 ISSN: 0960-7412 the whole document ---	1-13
X	SEKTAS M ET AL: "TIGHTLY CONTROLLED TWO-STAGE EXPRESSION VECTORS EMPLOYING THE FLP/FRT-MEDIATED INVERSION OF CLONED GENES" MOLECULAR BIOTECHNOLOGY, TOTOWA, NJ, US, vol. 9, no. 1, February 1998 (1998-02), pages 17-24, XP001034234 ISSN: 1073-6085 the whole document ---	1-13
P,X	WO 01 36595 A (DU PONT ;FALCO S CARL (US); YADAV NERENDRA S (US)) 25 May 2001 (2001-05-25) claims; figures; examples ---	1-13
P,X	WO 01 40492 A (UNIV ROCKEFELLER) 7 June 2001 (2001-06-07) claims; figures 4,5 ---	1-14
E	WO 02 16624 A (INST OF MOLECULAR AGROBIOLOGY ;SUNDARESAN VENKATESAN (SG); HONG YA) 28 February 2002 (2002-02-28) the whole document ---	1-13

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International Application No

PCT/US 01/23794

Patent document cited in search report	Publication date		Patent family member(s)	Publication date
US 5977441	A 02-11-1999	US US AU AU BR CA EP JP TR WO ZA	5925808 A 5723765 A 696668 B2 3205095 A 9508471 A 2196410 A1 0775212 A2 10503377 T 960448 A2 9604393 A2 9506410 A	20-07-1999 03-03-1998 17-09-1998 04-03-1996 28-10-1997 15-02-1996 28-05-1997 31-03-1998 21-07-1996 15-02-1996 11-03-1996
WO 9828431	A 02-07-1998	AU EP WO GB	5333098 A 0948633 A1 9828431 A1 2335195 A ,B	17-07-1998 13-10-1999 02-07-1998 15-09-1999
EP 1018560	A 12-07-2000	AU CA EP WO	7936898 A 2303201 A1 1018560 A1 9909191 A1	08-03-1999 25-02-1999 12-07-2000 25-02-1999
WO 9925840	A 27-05-1999	AU AU AU AU BR CA CA CA CA EP EP EP EP WO WO WO WO WO WO WO US US US US ZA ZA ZA ZA	1462999 A 1588499 A 1590499 A 1590599 A 9814669 A 2305866 A1 2306053 A1 2306184 A1 2306188 A1 1034262 A1 1034286 A1 1032680 A1 1032693 A1 9925855 A1 9925840 A1 9925854 A1 9925821 A1 6300545 B1 6331661 B1 6187994 B1 6262341 B1 9810528 A 9810529 A 9810532 A 9810537 A	07-06-1999 07-06-1999 07-06-1999 07-06-1999 20-11-2001 27-05-1999 27-05-1999 27-05-1999 27-05-1999 13-09-2000 13-09-2000 06-09-2000 06-09-2000 27-05-1999 27-05-1999 27-05-1999 27-05-1999 09-10-2001 18-12-2001 13-02-2001 17-07-2001 20-05-1999 20-05-1999 18-05-1999 25-05-1999
WO 9713401	A 17-04-1997	AU AU CA EP JP NZ WO US US	716781 B2 7662896 A 2234557 A1 0876094 A1 11514233 T 322673 A 9713401 A1 5677175 A 5929307 A	09-03-2000 30-04-1997 17-04-1997 11-11-1998 07-12-1999 29-09-1999 17-04-1997 14-10-1997 27-07-1999

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International Application No

PCT/US 01/23794

Patent document cited in search report	Publication date		Patent family member(s)	Publication date
WO 9604393	A	15-02-1996	US 5723765 A AU 696668 B2 AU 3205095 A BR 9508471 A CA 2196410 A1 EP 0775212 A2 JP 10503377 T TR 960448 A2 US 5977441 A WO 9604393 A2 US 5925808 A ZA 9506410 A	03-03-1998 17-09-1998 04-03-1996 28-10-1997 15-02-1996 28-05-1997 31-03-1998 21-07-1996 02-11-1999 15-02-1996 20-07-1999 11-03-1996
WO 0136595	A	25-05-2001	AU 2249901 A BR 0008910 A WO 0136595 A2	30-05-2001 29-01-2002 25-05-2001
WO 0140492	A	07-06-2001	AU 4505401 A WO 0140492 A2	12-06-2001 07-06-2001
WO 0216624	A	28-02-2002	WO 0216624 A1	28-02-2002